

are merely protective organs. These are found on such parts of the body (finger-tips, palms, sole) as are used for fine sensibility and yet are subject to violent pressure and injury. The corpuscle simply protects the nerve endings and thus allows a fine sensibility to be developed.

The time for writing the physiology of dermal sensations has not yet come, but the discoveries of Goldscheider and others give promise that the initial chapters of that book have been or are about to be written.

JASTROW.

PATHOLOGY.

Removal of a Large Sarcoma, Causing Hemianopsia, from the Occipital Lobe.¹ By W. R. BIRDSALL, and by ROBERT F. WEIR. (*Medical News*, April 16th, 1887.)

The following history, herewith reported conjointly by Dr. Weir and Dr. Birdsall, is that of a patient who during life presented left hemianopsia, optic neuritis, and certain disturbances in locomotion, from which the diagnosis of tumor of the right occipital lobe was made by several physicians, who also concurred in advising an operation attempting its removal, a fatal result appearing otherwise inevitable. As predicted, the tumor was found in the region described. It was removed in the manner to be stated by Dr. Weir, death resulting subsequently.

Male, æt. forty-two, a Hebrew, native of Poland, came under B.'s observation October 16th, 1886. Until the summer of 1885, he had always been healthy, and denied ever having had any form of venereal disease, or injury to the head. In August, 1885, after a sea-bath, he observed, for the first time, unsteadiness of gait, and had a severe attack of vomiting. Soon after diplopia for distance and increased awkwardness in walking were observed, and about the same time a disagreeable sensation, akin to numbness, in the right leg, hand, and shoulder, but not in the face. This and the diplopia were transitory. Headache, usually frontal, was present occasionally, but was never severe. Vertigo, or tendency in a definite direction, was not noticed at this time. No other sensory, motor, or visceral symptoms appeared. He was observed to miss articles when told to pick them up. This was probably due to the diplopia.

Oct. 7th, 1885. Dr. Seguin was the first to recognize in the patient the important localizing symptom, hemianopsia, and to make the correct diagnosis, and also to have seen him before and during the development of the optic neuritis, and at a recurrence of the diplopia.

"Examination: Eye muscles normal (no diplopia with red glass). Left pupil a trifle wider than right; both active; fundus normal. Has left lateral hemianopsia, vertical line passing a little

¹ In view of the interest attached to this case, the report is reproduced almost verbatim and at more than ordinary length.—ED.

to left of fixation point. No paresis of face, tongue, or limbs ; no anaesthesia ; patellar reflexes normal ; walk is somewhat staggering with decided tendency to right.

"29th. Diplopia has recurred ; left externus weak ; hemianopsia the same. No hemiopic pupillary reaction. Grasp : R., 42° ; L. 30°.

"Nov. 7th. Beginning neuro-retinitis discovered. This was verified ten days later by Dr. Gruening, who had already seen the patient for hemianopsia, and determined the extent of his visual field. Both externi paretic (this passed away later). His wife states that drowsiness in the daytime has been a marked symptom from the first ; also difficulty in rising from the chair."

Diagnosis made November, 1885 : Tumor of mesial aspect of right occipital lobe, involving primarily the cuneus, extending downward toward the tentorium cerebelli, and perhaps also upward toward the paracentral lobule (leg centre). During this period the patient was treated with large and increasing doses of potassium iodide.

From January to July, 1886, he was under the care of the late Dr. McBride. During the early months of this period his diplopia disappeared and never returned. His gait improved somewhat, though he had two attacks in which he suddenly, while walking on the street, felt that he could proceed no further, and at the same time had a strong tendency toward the left, and actually staggered to the left so that his wife was obliged to support him. After resting a few minutes he was able to walk again. No other symptom of importance could be elicited from the patient or his wife covering this period. In July, patient took a trip to California, and returned in September, in about the same condition, from which time on his difficulty in rising, standing, and walking, together with drowsiness, rapidly increased.

At the time of examination in October, 1886, left lateral hemianopsia was present. The ophthalmoscope revealed double optic neuritis, most marked in the left eye. Iris active to light and accommodation, the left pupil somewhat larger than the right ; no diplopia ; no ocular paresis evident. Smell, taste, hearing, and speech normal ; no word deafness or word blindness ; no anaesthesia, analgesia, or disturbance of temperature sense in any part of body. No paresis in muscles of face, trunk, or extremities. No tremor of tongue, face, or extremities. In testing the patient for ataxia by touching finger to the nose with eyes closed, his movements were clumsy rather than truly ataxic, at times being accurate, at others wide of the mark ; this was particularly noticeable with the left hand. A similar condition was noticed in the lower extremities, also more marked on the left. His gait was slow and uncertain. He was unable to find words to express the defects which he felt ; denying that it was muscular weakness, numbness, pain, tremor, stiffness, or vertigo, which caused his cautious yet awkward movements. Uncertainty of control seemed to be the

best term for it. He referred this chiefly to the right hip, thigh, and knee. His patellar tendon reflexes were rather active and about equal. In walking, he would frequently hit objects to his left, probably on account of the limitation of the visual field upon that side, and when seated at the table he would turn to the left, bringing a half profile view of the body and face to a person directly opposite. This was, probably, also due to the same cause, being an attempt to bring his limited field fully to the front of the table. There was no tenderness to pressure or pain on percussion of any part of the head. Frequent expectoration of a viscid saliva was an increasing symptom during the last few months of his life.

Diagnosis.—The symptom left hemianopsia could only be accounted for by a destructive lesion in the neighborhood of the gyrus cuneus of the right occipital lobe. The locomotory disturbances appeared to be due to the pressure effects of a tumor on structures below the tentorium, this implying a growth of considerable size.

No new symptoms developed, except that the right patellar tendon reflex became somewhat greater than the left. His disturbance of equilibrium continued to increase in a very irregular manner. On some days he would stand and walk quite well, on others he would suddenly stagger in walking, or fall over to one side when seated, usually forward and to the right, frequently with a twisting tendency of the body to the left. His steps became short, the feet being barely lifted from the floor, and with movements slow and cautious. Yet he could see well, reading the daily papers up to the last. On some days he was dull and listless, though never in a stupor; on others, was bright and talkative. His intellect was not impaired, and his family observed no change in his character or disposition. His sleep was natural, and hallucinations were never observed. He was extremely uncomfortable mentally, not from his visual defects, to which he attached little importance, but from his difficulties in locomotion, and disagreeable sensations.

Treatment with potassium iodide, which had been discontinued for some months, was resumed.

Drs. Seguin, Birdsall, Spitzka, and Jane way advised operation.

The characteristic feature of all his symptoms, except the hemianopsia and the optic neuritis, was their vacillating and intermittent nature, even to the oculo-motor disturbance, indicating pressure effects, or circulatory disturbance, rather than direct destructive action of the tumor.

The operation was performed March 9th, 1887, at the New York Hospital, whither the patient had been sent for more perfect control, and on account of the better antiseptic conditions there present. A dose of Hunyadi water was administered to move the bowels the morning of the operation. The head was also shaved, and the scalp washed with green soap and water, and then with

ether, and subsequently covered for several hours with carbolic cloths, wrung out of 1:30 solution and by gutta-percha tissue, all secured *in situ* by a bandage.

At 3 P.M., in the presence of Drs. Birdsall and Seguin as neurological counsel, and of Drs. Bull, Markoe, Abbe, Hamilton, C. T. Bull, Olcott, Starr, Dana, Sachs, and others, the operation was undertaken. The bregma, Rolanderic, and median lines having been marked out, and the occipital protuberance with some difficulty identified, and after the patient had had a hypodermatic injection of a quarter of a grain of morphia, and had been etherized, a U-shaped flap, three inches long and three wide, with base upward, was made under a carbolic spray, 1:30, so as to straddle irregularly the median line in its lesser part, the greater part being over the right posterior cerebral lobe. The bleeding was free from this, and from the thick periosteum, and also from the skull itself. At one inch above the occipital protuberance, and the same distance from the median line—in other words, beyond the limits of both the longitudinal and lateral sinuses—the circumference of a one-inch trephine was placed, and the bone, which was rather thin, cut through. A second button was removed immediately above the first, and the intervening bridge gnawed away by a rongeur forceps. The edge of this resulting aperture was further enlarged by taking away externally the cranium with the same instrument until an oval opening, measuring two and three-quarters by two and a quarter inches, was made. The dura mater, non-pulsating, rose tensely in the space, and was of a deeper hue than normal. This membrane was divided for two-thirds of the extent of the bone opening, its retained attachment being toward the median line, so as to avoid encroaching on the longitudinal sinus. As it was cut and turned back, the brain—or what was at first taken for brain, but was immediately recognized as the tumor—at once rose into the bony opening. It was of a purplish-red color, like kidney structure, and was covered over by a thin cellular tissue, with large veins ramifying in it. With a director and the edge of a spoon handle, a thin, yellowish layer of flattened-out, expanded brain tissue was loosened from the tumor on its outer side, and in this direction the enucleation was accomplished to a depth of nearly an inch. Similarly proceeding, but without seeing any further brain substance, the tumor was loosened easily on all sides. Additional room was obtained for manipulation by cutting away freely of the cranium externally, but all was insufficient to obtain access to the outlying edges and base of the growth. The tumor was, therefore, incised, and some of its softened, granular, and fatty-looking contents forced out. This somewhat diminished its size, and enabled the forefinger to be passed between the cranium and tumor, and by its aid the delicate cellular attachments that held the mass in place were felt to yield easily, and enucleation became possible, and the base finally reached. By now drawing the finger gently, but firmly, toward the cranial opening, the tumor was torn nearly

completely in two, and its outer half lifted out, and then the inner part, with the help of the finger-end and nail, separated from the falx and withdrawn.

Inspection of it showed that it had been entirely removed, and that its probable attachment was toward the posterior border of the falx. A good deal of venous bleeding took place from the huge cavity left by the removal of the tumor. This was stopped with four sponges, and temporary pressure in this way resorted to. After a few minutes they were removed, and the cavity inspected by the light of a small electric lamp, which showed the immense compression of brain tissue that had taken place, the falx being crowded over toward the left beyond the median line, and the tentorium depressed to a horizontal line. The tumor itself told the story better, for it, as was afterward learned, weighed one hundred and forty grams, or five and a quarter ounces, and measured three and a quarter inches by two and three-quarters, and was two and a half inches thick. Its greater circumference was eight and a half inches, and its lesser seven inches.

As the hollowed-out brain was lifted up by a retractor, two bleeding points were seen, one being in the region of the straight sinus, though not free enough for that vein, and probably belonging to the pedicle of the growth, and the other apparently was arterial, and possibly from a terminal branch of the posterior cerebral artery. The flow from each was readily checked by direct pressure, and it was determined, on consultation, to control them by packing this cavity with iodoform gauze of five-per-cent strength. This was done not too strongly, it being assumed that the released brain would also contribute additional pressure, and the ends of the strips of gauze subsequently were, for easy extraction, allowed to emerge from the lower angle of the scalp wound. The dura mater was partly united over the gauze by several loose sutures (instead of being closely brought together, as had been done in another case), and the scalp wound closed with catgut sutures, a rubber drainage tube being introduced under the skin up to the skull opening. Over these, sublimated and iodo-formed peat bags with sublimated loose compressors of gauze and absorbent cotton were secured with gauze bandages, and the patient put to bed.

The operation was well borne until the final enucleation took place, when the pulse decidedly fell, apparently from the loss of blood, which was then suddenly augmented, and which amounted, in the whole operation, to some ten or twelve ounces—the oozing being persistent from the scalp and diploë, and difficult to control entirely by ligatures, clamps, and finger pressure. By bandaging the limbs and by the administration of whiskey subcutaneously his condition improved, and at the close of the surgical work he was in a fair condition. Pulse 132, but regular and of good volume. Slight diverging strabismus was, however, noticed in the left eye. He was ordered stimulants by the skin and rectum.

Hot bottles, duly protected, were placed in the bed, and his head kept low, and enemata of whiskey, $\frac{5}{4}$ i., and milk were ordered every two hours, with stimulants, hypodermatically, if required.

The patient came out of the ether quickly, and showed considerable restlessness, moving all his limbs and having proper voice. By 7.30 P.M., two hours after the operation, the pulse had become slower, 120, but gradually weaker, and the dressings were stained with blood which had soaked through them at one point. This deterioration of the pulse continued until I saw him with Dr. Birdsall, at about 10 o'clock, when he was found very restless, and with an extremely weak pulse, and increasing marks of blood soaking in the dressings. The patient, however, was conscious, though somewhat dull. A salt transfusion (common salt, 93 grains, carb. sodæ, 16 grains, to one quart of filtered water, to which solution three per cent of sugar is added, as suggested by Landerer) of nearly two quarts was slowly injected into the median basilic vein at the right elbow with immediate improvement in the pulse and consciousness. He became also more quiet, and could answer questions, and put out his tongue fairly straight. He, however, showed signs of slight paralysis of the ocular branch of the seventh nerve on the left side, and also had decided divergent squint of the left eye. His hemianopsia was tested by Dr. Birdsall, and found to be unchanged.

As it was evident that part of his deterioration was due to a loss of blood, it became imperative to see if its continuance could be arrested. The dressings were, therefore, quickly removed, and the flaps of the scalp freed by cutting the stitches and raised, when blood was seen to escape in a small stream through the tube from the brain cavity. At first it was intended to remove the packing, and to secure the bleeding points by clamps; but his pulse, which had been raised by the transfusion, suddenly gave out, or so nearly so as to cause me to abandon the idea of resorting to any procedure of length, and to content myself, with Dr. Birdsall's approval, of further crowding in additional iodoform gauze toward the supposed source of hemorrhage. This was done, the flaps replaced, but not resutured, and dressings reapplied. Symptoms of stupor quickly came on, and fearing lest the pressure might cause this, the dressings were loosened by cutting, but the patient's condition continued alarming, and his pulse became absent at the wrist, but was restored by a second transfusion. While the circulation was thus improved, the other symptoms were not similarly affected. The transfusion was kept up experimentally, though the patient's condition was hopeless, and by its means the heart was kept acting till 2 o'clock A.M., when he died.

No autopsy was allowed on account of religious scruples, but on removing the packing of iodoform after death, in the lower and anterior part of the cavity was seen quite a large collection of coagulated blood. The tumor was reported by the pathologist of the hospital, Dr. Peabody, to be a spindle-celled sarcoma with a few round cells sparsely found in it, and not to be very vascular.

REMARKS BY DR. WEIR.—There are several surgical points of interest in connection with the forgoing case that may be cursorily dwelt upon. The most important, because it largely entered into the cause of death, was the erroneous method adopted of arresting the hemorrhage. I had previously encountered lacerated vessels in the substance of the brain, the first time in 1882, and twice since then, and had secured them by ligature or by torsion, but none of these were at a greater depth than an inch from the surface. From the effects of sponge pressure, I was led to believe in the present case that the openings in the blood-vessels could be easily controlled, in which idea I was mistaken; the bleeding was also probably favored by the headlow position which his shocked condition induced me to direct. It would have been more correct perhaps to have tried cautiously to elevate his head, and in this way to diminish the blood pressure. On a review of the case, however, I believe it would have been better surgery, and in another instance I would so act, to control the bleeding at once from vessels too deeply placed for a ligature, by means of clamp forceps which might protrude through an opening in the flap, and be removed after a period of twenty-four or forty-eight hours, as is done by Richolot's forceps in the vaginal removal of the uterus.

The size of the tumor, it is hardly necessary to state, exceeded anticipation, those usually encountered being smaller, although one has recently been reported by Horsley which weighed four ounces, and produced hemiplegia and coma at the time of the operation. In the present operation, though the size of the skull opening was fully two and three-quarters by two and one-quarter inches, further bone room would have allowed an easier extraction of the growth. This enlargement was most desirable toward the median line, and would have been resorted to without much hesitation had the attempt at enucleation failed, for sundry experiences of injuries over the longitudinal and lateral sinuses, together with those obtained in the cadaver, had convinced me that the skull over such a sinus can be removed without opening it, and without giving rise to any incontrollable bleeding or subsequent risk. In the rehearsals made for this particular case, which were conducted on the possibility of the growth projecting from the inner side of the cuneus against the falx, as was seen in one of Dr. Seguin's cases, it was ascertained that after the bone was gnawed away over the longitudinal sinus, that the dural flap, whose attached base was toward the sinus, could be so pulled upon as to expose fairly the median plane of the brain, aided by a spatula lightly pressing the latter outward. The same procedure could be applied to the inferior surface in respect to the lateral sinus, so as to expose to a considerable depth the tentorium. Such an examination was conducted in a patient whom I shall present in a few moments to illustrate another point, and in whom a frontal lobe was largely opened up to view for the relief of traumatic epilepsy of thirty-five years' duration. The lateral sinus, I may also remark, has been

exposed by others besides myself, viz., by Schondorff, Lucae, and by Knapp, to a varying extent, without mishap.

The size of the skull opening, therefore, should be large, and Horsley advises the use of a two-inch trephine, and makes two openings with this instrument, connecting them with a saw and cutting forceps. The apprehension that this large vacuity in the calvaria would subsequently expose the patient to the risk of easily inflicted cerebral injury, is not so great as imagined, and can be greatly lessened by resorting to the expedient first practised elsewhere in the body by Macewen, of employing bone grafts, and by sprinkling, as Horsley does, over the dura after its edges have been sewn together, the chopped-up disk of bone, which is to be carefully kept warm till the completion of the operation.

A further step in this direction has been made by Poncet, who has shown that pieces one-third of an inch long and one-sixth of an inch wide, can be similarly used. I recently ventured, in the case of trephining for epilepsy which was just mentioned, after exposing the brain and dividing an adhesion extending between the pia and dura mater, through an opening nearly two and a half by three inches, to replace, after closing the dural opening, the two one-inch disks of bone which had been removed by the trephine. These had been wrapped in a towel wrung out of warm carbolic solution, which in its turn was then placed in a jar immersed in warm water. The operation lasted fully half an hour before the bones were put back. It is now seven weeks since the operation, and you will perceive, in the patient who is now submitted to your inspection, that the wound is all healed, save at one point over the eyebrow, where an opening was made recently downward through an obstructed suppurating frontal sinus to the nose, to permit drainage, and that no communication leads to the circles of bone, which can be felt above the point, solid, resisting, and painless. Later still, Dr. McBurney, at St. Luke's Hospital, has repeated this procedure, after an exploratory operation, for brain disease. This plan, if corroborated by further experience, will relieve our minds of the objections held to large openings in the skull, and will facilitate greatly bolder surgical explorations.

Up to the present time the opening of the skull for the extraction of a contained tumor has been resorted to eight times, once by Bennett and Godlee in 1884, three times by Horsley in 1886, which, with the one above narrated, make up the five cases of removal of a tumor, the result of which in two of Horsley's is yet unknown, but presumably it was a successful one. Of the three other cases, in one by Hirschfelder and Morse in 1886, the tumor was found, but only a part was removed, the patient dying shortly afterward from suppurative encephalitis; in the two remaining cases no tumor was found, though in the one operated on by me, and reported at length in *The Medical News* for March 5th, 1887, at the post-mortem, two and a half months later, a tumor was found pressing upon the cerebellum and spinal cord.

The last case is the one reported by Dr. G. M. Hammond, and made the subject of the paper succeeding this, to be read before this Society, in which the search nearly succeeded, as was shown afterward at an autopsy. The cause of the symptoms was the presence of three cysts adjacent one to another, and thought to be of hydatid origin.

REMARKS BY DR. BIRDSALL.—In concluding, I may be allowed a few remarks concerning the tumor which was found. Owing to its large size, so much of the occipital lobe was compressed by it that the case is of little value for the purpose of determining the limitation of the visual area in the occipital lobe. The growth was a sarcoma, originating in the meningeal structures, and producing destruction of the cerebral tissues by pressure alone; no part of it was infiltrated into the cortex. The absence of severe headache in this case should be noted, as it is usually a prominent symptom of tumor involving the meninges.

That convolutions may be reduced to the thinness of paper by such a process is well known, and in this case the apex of the occipital lobe was literally crushed between the tumor and the cranium, while the more frontal portions were compressed in that direction. The parts beneath the tentorium were also compressed, as the symptoms during life led us to infer. The remarkable feature of cases with so large a tumor is not so much that they give rise to localization symptoms, as that they exhibit so few.

One of the most important lessons that the study of cerebral tumors teaches is that growths remaining limited to meninges may attain a large size before disturbing the function of neighboring parts of the brain, frequently giving rise to less marked symptoms than very small growths, which infiltrate the cortex. In the deeper conducting tracts of the brain, where fibres run more in parallel courses, growths may attain large size without producing much irritation or destruction, by slowly pushing the fibres aside; this gradual expansion could not go on in the felt-like mass of fibres in the cortex without destructive action resulting. Thus, in one of my reported cases,¹ a sarcoma the size of a hazelnut displaced the cortex of the arm area, producing spasm and paresis of the arm, while a similar growth under the same area of the opposite hemisphere, but a few lines deeper yet not reaching the cortex, gave rise to no symptoms whatever. Again, when tumors destroy by pressure, the softer mass of the growth may injure less than the rigid walls of bone against which the cerebral tissue is compressed; so that regions away from the tumor may give signs of impairment before those in contact with the tumor. These are some of the contingencies (and there are others) which will probably always constitute obstacles to the correct localization of tumors, as guides to surgical operations for their removal.

¹ Arch. Med., vol. ix., No. 3, 1883.